

CLAIMS

1. A hybrid actuator through which a linear drive is applied to a load, comprising: an actuator shaft connected to the load; a plurality of electrically energized motors positioned over the shaft; a plurality of solid-state thrusters positioned on the actuator shaft in operative relation to the motors; clutch means mounted on the actuator shaft in engagement with the thrusters for transfer of thrust force to the actuator shaft during operation in response to energization of the motors; and amplification means for amplifying force and stroke output of said motors to cyclically control said operation of the clutch means and effect said drive of the load.
2. The hybrid actuator as defined in claim 1, wherein said clutch means comprises: a plurality of self-locking clutch units positioned on the actuator shaft in angularly spaced relation to each other.
3. The hybrid actuator as defined in claim 2, wherein said amplification means amplifies the thrust force transferred to the shaft during compliant strokes under directional control of the clutch means.
4. The hybrid actuator as defined in claim 3, wherein each of said solid-state thrusters includes: magnetostrictive rods on which coils are mounted.
5. The hybrid actuator as defined in claim 4, wherein each of the motors includes: a motor shaft in axial engagement with the amplification means; a plurality of permanent magnets

positioned on the motor shaft; and motor winding coils electrically connected to a power source and operatively positioned about the motor shaft over the permanent magnets.

6. The hybrid actuator as defined in claim 1, wherein said amplification means amplifies the thrust force transferred to the shaft during compliant strokes under directional control of the clutch means.

7. The hybrid actuator as defined in claim 1, wherein each of said solid-state thrusters includes: magnetostrictive rods on which coils are mounted.

8. The hybrid actuator as defined in claim 1, wherein each of the motors includes: a motor shaft; a plurality of permanent magnets positioned on the motor shaft; and motor winding coils electrically connected to a power source and operatively positioned about the motor shaft over the permanent magnets.

9. The hybrid actuator as defined in claim 2, wherein said actuator shaft has a cross-section forming planar surfaces on which the clutch units are respectively positioned.